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Salicornia shoots

Microbiological and sensorial analysis of *Salicornia* shoots preserved in controlled atmosphere

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INTRODUCTION

Salicornia is a succulent, herbaceous plant that grows in salty soils, usually nearby the salt marshes. Belonging to the family *Chenopodiaceae*, *Salicornia* is an edible plant, with articulate stems and reduced, scale-like leaves. It is very rich in vitamins, iodine, phosphorus, calcium, silicon, zinc, manganese, and also in diuretic, depurative and resolutive substances. Because of its biochemical composition, *Salicornia* is already used in salads and as pickles, being considered a *delicatessen*.
Nevertheless, there is scarce information in what concerns the preservation of *Salicornia* shoots, the eventual chemical alterations or the general aspect of the plant during shelf life.
Controlled/modified atmospheres associated with low temperatures have been widely used to preserve and maintain sensorial and biochemical characteristics of other fruit and vegetables.
The objective of this study was mainly to perform the microbiological analysis followed by sensorial evaluation, during a four-week storage at 4ºC.

METHODOLOGY

Biological material

- Shoots of *Salicornia* (Necton, Belamandil – Olhão, Algarve) were disinfected in a 0.5% acetic acid solution, 15 min (Porto and Eiroa, 2006)

Conditions of the experiment

- four different atmospheres
  - A0 – vacuum
  - A1 – normal air
  - A2 – 2-3% O_2 and 4-6% CO_2
  - A3 - 2-3% O_2 and 8-10% CO_2
- Temperature: 4ºC

Four replicates of 20 g were used for each condition and each day of analysis.
Storage was studied during a four-week period.

Microbiology

- *Total counting of mesophilic bacteria*
  - Plate Count Agar (PCA) medium
  - Temperature: 30ºC
  - During 72h
- *Total coliforms*
  - Violet Red Bile Lactose agar (VRBL) medium
  - Temperature: 30ºC
  - During 24h
- *Total yeasts and molds*
  - Dicloran Rose Bengal Chloramphenicol agar (DRBC) medium
  - Temperature: 25ºC
  - During 5 days

Analyses were performed before and after disinfection, and once a week.

Sensorial analysis

- by a trained panel (12 panellists)
- parameters studied: colour, basic flavour, aroma and texture
- analyses were performed in the beginning and once a week. Scale used the scores 1 (very bad) to 5 (very good). Values attributed by panellists were put into a graphic (figure 2) – regular concentric lines correspond to a specific score from 1 to 5, from the centre to the periphery.

RESULTS AND DISCUSSION

In the beginning, shoots were crispy and succulent, despite the salinity and the fibrous character.

Figure 1. Aspect of shoots by the end of the 1st week of storage under different atmospheres: from left to right, A0, A1, A2 and A3.

Panel also attributed a wide range of aromas to the shoots submitted to the different atmospheres, which varied with the storage period.

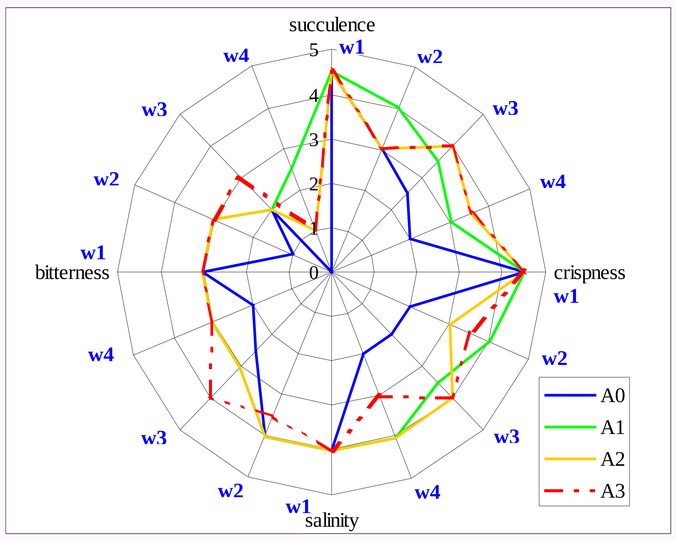

Figure 2. Evolution of the more relevant sensorial characteristics of *Salicornia* shoots submitted to different controlled/modified atmospheres (w1 to w4 - weeks of treatment). Each of the parameters is analysed clockwise.

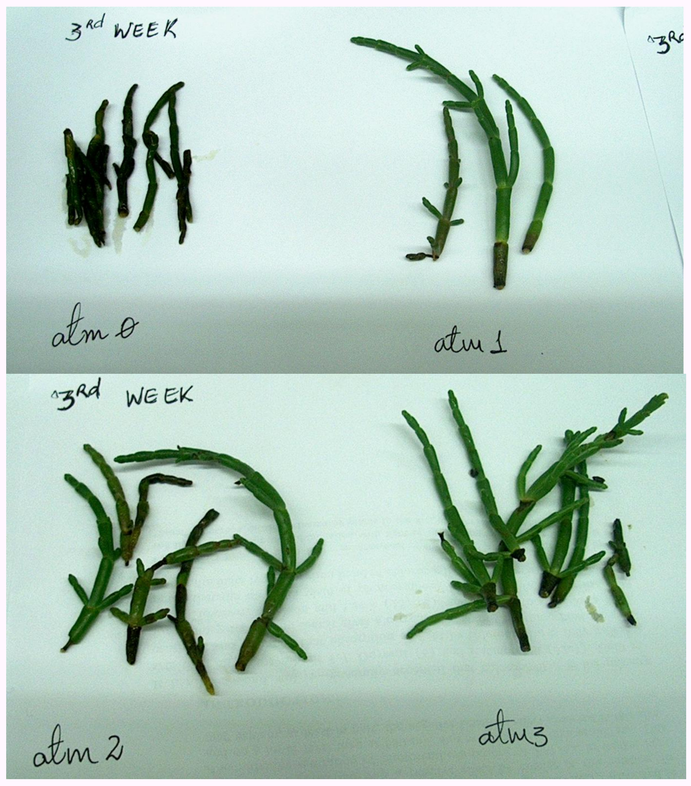

Figure 3. General aspects of *Salicornia* shoots by the end of the 3rd week of storage under different atmospheres.

In what concerns to the astringency and fibrous character, panellists did not find any significant difference neither between different atmosphere conditioning, nor any evolution along the time of storage.

Microbiological analyses showed safe results till the end of the storage period (four weeks), always below the critical limits of acceptability for vegetables (Jacxsens *et al.*, 2002). However, panellists rejected evaluation of samples from the last week of treatment: colour and the good aspect were lost, mainly due to the loss of water, and the aroma showed already the effects of some fermentation.

Nevertheless, by the end of the third week, shoots under A3 showed a better aspect than those from A2 and A0 (figure 3). Shoots under A2 had already lost much of their water and those under vacuum (A0) were somewhat fermented and too much "crushed" because of the pressure applied by the vacuum.

Therefore, the atmosphere richest in CO_2 (A3) could be advisable to preserve shoots of *Salicornia*. But, as shoots under A1 (normal air) also presented good results in what concerns to the general aspect and sensorial characteristics, other chemical analyses are being performed to confirm this hypothesis.

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